

WHAT IS CLAIMED IS:

1. An information processing apparatus that derives the calibration information needed to measure the position and/or attitude of a measuring object based on the output values of a position and/or attitude sensor, comprising:

input means for entering information about a match between the position and/or attitude of said measuring object and a predetermined position and/or attitude;

- acquisition means for acquiring the output values from said position and/or attitude sensor according to the input by said input means; and

operation means for deriving said calibration information, based on said predetermined position and/or attitude and the output values of said position and/or attitude sensor acquired by said acquisition means.

2. The information processing apparatus according to claim 1, wherein:

said position and/or attitude sensor has been connected directly or indirectly to said measuring object and the output values of said sensor are information that represents the position and/or attitude of said sensor itself in the sensor coordinate system; and

said calibration information contains first  
coordinate transformation information for converting  
the position and/or attitude of said sensor itself in  
the sensor coordinate system into the position and/or  
5 attitude of said measuring object in the sensor  
coordinate system and second coordinate transformation  
information for converting the position and/or attitude  
in the sensor coordinate system into the position  
and/or attitude in a global coordinate system.

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3. The information processing apparatus according to  
claim 1, further comprising guiding means for guiding  
said measuring object to said predetermined position  
and/or attitude.

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4. The information processing apparatus according to  
claim 2, wherein:

the measurement of said position and/or attitude  
is measurement of position and attitude, and said  
20 sensor is a position and attitude sensor; and

said operation means performs the process of  
determining attitude information among said first  
coordinate transformation information and position  
information among said second coordinate transformation  
25 information.

5. The information processing apparatus according to claim 2, wherein:

the measurement of said position and/or attitude is measurement of only attitude, and said sensor is an attitude sensor; and

said operation means performs the process of determining pitch-angle and roll-angle information among said first coordinate transformation information and yaw-angle information among said second coordinate transformation information.

6. The information processing apparatus according to claim 2, wherein:

the measurement of said position and/or attitude is measurement of only attitude, and said sensor is an attitude sensor; and

said operation means performs the process of determining yaw-angle information among said second coordinate transformation information.

7. The information processing apparatus according to claim 1, wherein said measuring means is a magnetic sensor.

8. The information processing apparatus according to claim 1, wherein said measuring object is the viewpoint of the user observing a display device that displays

virtual space superimposed over the real space  
transmitted optically through a display screen.

9. The information processing apparatus according to  
5 claim 1, wherein said measuring object is the viewpoint  
of an imaging means for capturing real space.

10. The information processing apparatus according to  
claim 8, wherein said guiding means comprises:  
10 geometry information storage means for storing  
geometry information of an object;  
picture generation means for calculating the two-  
dimensional appearance of said object expected to be  
observed on said display screen when said user observes  
15 said display screen in said predetermined  
position/attitude, based on said predetermined  
position/attitude of said viewpoint and the geometry  
information of said object stored in said geometry  
information storage means to generate its picture; and  
20 picture presentation means for presenting said  
picture generated by said picture generation means on  
said display screen; and wherein

said information processing apparatus moves the  
viewpoint of said user to said predetermined  
25 position/attitude by moving it such that the image of  
real space observed through said display screen and the

image of said object displayed on said display screen  
will match geometrically on said display screen.

11. The information processing apparatus according to  
5 claim 9, wherein said guiding means comprises:

geometry information storage means for storing  
geometry information of an object;

picture generation means for calculating the two-  
dimensional appearance of said object expected to be  
10 observed on said display screen when said imaging means  
captures real space in said predetermined  
position/attitude, based on said predetermined  
position/attitude of said viewpoint and the geometry  
information of said object stored in said geometry  
15 information storage means, and superimposing its  
picture over the picture of real space captured by said  
imaging means to generate a superimposed picture; and

picture presentation means for presenting said  
superimposed picture generated by said picture  
20 generation means to the operator; and wherein

said operator moves the viewpoint of said imaging  
means to said predetermined position/attitude by moving  
said imaging means in such a way that the picture of  
said real space and image of said object superimposed  
25 over it will match geometrically on said superimposed  
picture presented by said picture presentation means.

12. The information processing apparatus according to claim 1, wherein said guiding means comprises:

imaging means for capturing real space, having a viewpoint whose relative position/attitude with respect to said measuring object is known;

geometry information storage means for storing geometry information;

picture generation means for calculating the two-dimensional appearance of said object expected to be observed on said display screen when said imaging means captures real space in said predetermined position/attitude, based on the position/attitude of the viewpoint of said imaging means determined from said predetermined position/attitude of said measuring object and said relative position/attitude as well as on the geometry information of said object stored in said geometry information storage means, and superimposing its picture over the picture of real space captured by said imaging means to generate a superimposed picture; and

picture presentation means for presenting said superimposed picture generated by said picture generation means to the operator; and wherein

said operator moves said measuring object to said predetermined position/attitude by moving said imaging means in such a way that the picture of said real space and image of said object superimposed over it will

match geometrically on said superimposed picture  
presented by said picture presentation means.

13. The information processing apparatus according to  
5 claim 10, wherein said object contains markers placed  
in real space and said geometry information contains  
position information of said markers.

14. The information processing apparatus according to  
10 claim 10, wherein said object has an area or volume in  
real space and said geometry information contains shape  
information of the object.

15. The information processing apparatus according to  
15 claim 14, wherein said picture generation means draws a  
wire frame image of said object.

16. The information processing apparatus according to  
claim 10, wherein said object contains a virtual object  
20 to be superimposed over real space.

17. A mixed reality presentation apparatus which  
displays virtual space superimposed over a picture of  
captured real space on a display screen or displays  
25 virtual space superimposed over the real space  
transmitted optically through a display screen, based

on the output values of a position and/or attitude sensor, comprising:

an information processing apparatus according to claim 10; and

5 switching means for switching between presentation mode that presents mixed reality and derivation mode that derives calibration information; wherein

the calibration information needed for presentation of said mixed reality is derived in said  
10 derivation mode and mixed reality is presented using the calibration information in said presentation mode.

18. The mixed reality presentation apparatus according to claim 17, wherein said apparatus presents a wire  
15 frame of marker locations or objects, etc. in addition to, or in place of, all or part of what is superimposed in said presentation mode.

19. The mixed reality presentation apparatus according to claim 17, wherein said apparatus shares all or part  
20 of the object's geometry information used for said derivation mode with said presentation mode.

20. The mixed reality presentation apparatus according to claim 17, wherein display means is shared between  
25 said derivation mode and said presentation mode.



21. An information processing method that derives the calibration information needed to measure the position and/or attitude of a measuring object based on the output values of a position and/or attitude sensor that  
5 detects the position and/or attitude of said measuring object, comprising:

an input process of entering information about a match between the position and/or attitude of said measuring object and a predetermined position and/or  
10 attitude;

an acquisition process of acquiring the output values from said position and/or attitude sensor according to the input in said input process; and

an operation process of deriving said calibration  
15 information, based on said predetermined position and/or attitude and the output values of said position and/or attitude sensor acquired in said acquisition process.

20 22. A mixed reality presentation method which displays virtual space superimposed over a picture of captured real space on a display screen or displays virtual space superimposed over the real space transmitted optically through a display screen, based on the output  
25 values of a position and/or attitude sensor, comprising:

an information processing method according to  
claim 21; and

switching process of switching between  
presentation mode that presents mixed reality and  
5 derivation mode that derives calibration information;  
wherein

the calibration information needed for  
presentation of said mixed reality is derived in said  
derivation mode and mixed reality is presented using  
10 the calibration information in said presentation mode.

23. A computer-readable storage medium which stores  
the program code for executing the information  
processing method according to claim 21.

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24. A computer-readable storage medium which stores  
the program code for executing the mixed reality  
presentation method according to claim 22.